ORIGINAL ARTICLE

Outcome of surgical treatment of cervical spondylotic myelopathy: Experience in 120 patients

Ibrahim Farooq Pasha,[1] Ahmed Bilal Khalique,[2] Muhammad Asad Qureshi,[3] Muhammad Talha,[4] Maheen Farooq,[5] Wasim Afzal,[6] Junaid Ismail,[7] Naveed Ahmad[8]

Abstract

Objectives: To document the outcome of spinal surgery in patients of cervical spondylotic myelopathy.

Methods: The quasi-experimental study was conducted at the Department of Spine Surgery at Combined Military in a tertiary care hospital in Rawalpindi from 2006 to 2013. A pre-designed proforma was used for each patient and records were kept a custom-built computer database. Neurik grading was used to assess neurological status preoperatively, at 6 months, 1 year and 2 years.

Results: There were 120 patients with a mean age of 60.08 years (range 26-82, standard deviation 13.13). Of them 108 (90%) were males and 12 (10%) females. The preoperative neurologic status was Nurick's grade 0 in 6 (5%) patients There were 120, I in 9 (7.5%), II in 23 (19.16%), III in 28 (23.33%) and IV in 19 (15.83%) and V in 35 (28.16%). The spine was approached anteriorly in 48 (40%) patients and posteriorly in 72 (60%). Single level was involved in 23 (19.16), two in 30 (25%), three in 22 (18.33%) and four in 45 (37.5%) cases. Anterior cervical disc excision and fusion was done in 26 (21.67%), anterior corpectomy and fusion with bone graft or a cage in 21(17.5%) cases, laminoplasty in 9 (7.5%), laminectomy with lateral mass screw fixation with reconstruction titanium plate in 37 (30.83%) or with rod 24 (20%). In 3 (2.5%) cases only decompressive laminectomy was done. At 6 months Nurick 0 was in 26 %21.67%), I in 14 (11.67), II in 17 (14.16), III in 21 (17.5), IV in 29 (24.16%) and V in 13 (10.83). At one year Nurick grade was 0 in 38 (32.67%, I in 16 (13.33%), II in 14 (11.67), III in 15 (12.5%), IV in 23 (19.16) and V in 14 (11.67%). At the end of 2 years Neurik grade was 0 in 40 (33.33%), I in 15 (12.5%), II in 13 (10.83%), III in 16 (13.33%), IV in 22 (18.33% and V in 14 (11.67%).

Conclusion: Single, double and triple levels with predominantly anterior cervical spondylotic myelopathy pathology can be operated anteriorly while multi-level disease with lordotic spine should be approached posteriorly.

Keywords: Cervical spondylotic myelopathy, CSM, Laminectomy, Spinal fusion. (JPMA 65: S-72 (Suppl. 3); 2015)

Introduction

Cervical spondylotic myelopathy (CSM) is a slowly progressive disease of aging resulting from degenerative changes in the spine that can lead to spinal cord dysfunction and significant functional disability. Cervical spondylosis is a spectrum of pathology presenting as neck pain, radiculopathy, and myelopathy or all in combination.[1] The degenerative changes and abnormal motion lead to vertebral body subluxation, osteophyte formation, ligamentum flavum hypertrophy, and spinal canal narrowing. The repetitive movement during normal cervical motion may result in micro trauma to the spinal cord.

The natural course of CSM is unpredictable but asymptomatic patients with cervical stenosis and abnormalities on electro-physiologic studies may be at higher risk for developing myelopathy.[2]

[1-4,6-8]Department of Spine Surgery, CMH, Rawalpindi, [5]Medical Student, Allama Iqbal Medical College/Jinnah Hospital, Lahore, Pakistan.

Correspondence: Ibrahim Farooq Pasha. Email: ifpasha@hotmail.com

The pain is reported by about half of the patients with CSM, but is not severe mostly. After decompressive surgery, the intensity of all these pain components decreases. Low axial pain, a reflection of CSM-related spasticity perceived in the lumbosacral region, became prominent in many patients after surgery.[3] The ventilator functions are impaired in some patients due to affected respiratory muscles.[4] The clinical examination in CSM shows hyperreflexia, Hoffman sign, inverted brachioradialis reflex, clonus, and Babinski signs.[5] The imaging of cervical spine is essential for diagnosis and preoperative planning and can differentiate among central, subarticular, and lateral stenosis and in the assessment of myelopathy.[1]

The surgical techniques are through anterior, posterior, or circumferential approaches. Under most circumstances, one approach will produce optimal results. It is important that the surgical plan is tailored to address each individual's unique clinical circumstance.[6] The pathological changes include atrophy of grey matter, glial

scar formation and shrinking of white matter which does not coincide with relief of clinical symptoms. Therefore it is better to operate earlier in cases of CSM because delay may lead to irreversible histological changes.[7] Those patients with high signal intensity on T2-weighted magnetic resonance imaging (MRI) usually had a poor prognosis even after undergoing surgery than those with negative signal on T2-weighted image.[8]

The posterior approaches are usually made when pathology is posterior, multilevel, spine is in lordosis and there is contraindication to anterior surgery. The surgical intervention in CSM aims at decompressing the spinal cord and maintaining stability of the cervical spine. Laminoplasty is a major surgical advancement as laminectomy results in kyphosis and unsatisfactory outcomes.[9] The indications for treating CSM with laminectomy and instrumented fusion remain ill-defined. Cervical laminectomy without instrumented fusion has been associated with suboptimal outcomes, particularly in the setting of cervical kyphosis.[10] Laminoplasty is an established procedure for the decompression of multi-segmental CSM. Modified double-door laminoplasty is a safe, reliable and effective procedure.[11]

Anterior spinal decompression and instrumented fusion is successful in preventing CSM progression and has been shown to result in functional improvement in most patients.[12] Anterior cervical decompression and fusion is most successful when bone graft is combined with stabilizing instrumentation. The use of bioresorbable anterior cervical plates has been reported recently instead of the traditional titanium plates.[13] Intra-operative computed tomography (CT scan) on O-arm Image system are helpful in intra-operative evaluations.[14]

Patients and Methods

The quasi-experimental study was conducted at the Department of Spine Surgery Combined Military Hospital (CMH), Rawalpindi, from 2006 to 2013 and comprised CSM patients with at least two years follow-up. Those treated conservatively because of unwillingness, unfit or for any reason, lost to follow-up or died during the follow-up were also excluded. A pr-designed performa was used for each patient and records were kept in a custom-built computer database.

All patients were prepared for surgery and multi-discipline specialist consultations were made because many of these patients had co-morbid diseases. Most of the patients were operated without neuro-monitoring but some were operated with this. Image intensifier was used in all cases to mark the level involved and proper implant placement. Anatomical land- mark guidelines were used to place the screws and were later confirmed by image intensifier per-operatively.

For anterior approach patients were anaesthetized supine and strapped to the operating table for shoulder clearance during imaging. The patients were anaesthetised and then turned prone one pillows or bolsters for posterior approach. Intensive care bed with ventilator bed facility was booked for all patients prior to the surgery. After surgery they were nursed in such facility for any ventilator support.

Depending upon patients neurological condition they were mobilised in a cervical collar as the effect of anaesthetic drugs weaned off. They were rehabilitated by a specialist in the rehabilitation room. Patients with severe neurological deficits were shifted to the spinal rehabilitation ward in a tertiary care rehabilitation institute exclusively made for such patients. Antibiotics were prescribed for 2 days post-operatively, dressing was changed when soaked, drain was removed when daily drain was less than 50 ml. Surgical stitches were removed 5-7 days for anterior surgery and 10 days in posterior surgery.

Neurik grading was used to assess neurological status of the patients. The pre-operative neurological assessment with Neurik grading was done depending upon patients walking ability. Then further assessments were done at 6 months, 1 year and 2 years. During examinations any complications encountered were identified and treated. The co-morbid diseases were treated by relevant consultants throughout their stay in hospital and during follow-up.

Results

There were 120 patients with a mean age of 60.08 years (range 26-82, standard deviation 13.3). Of them 108 (90%) were males and 12 (10%) females. The

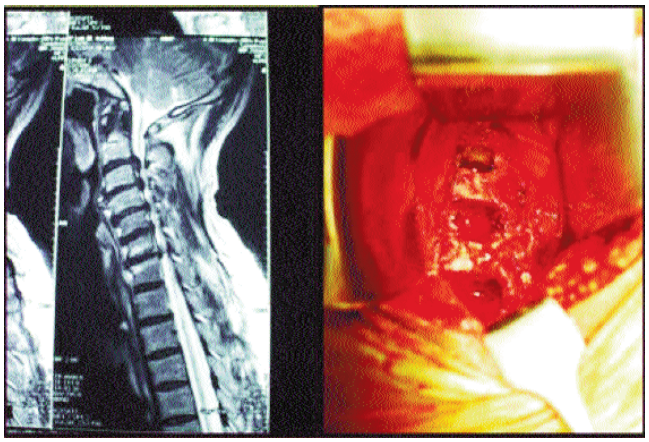

Figure-1: Three level Cervical Spondylotic Myelopathy (CSM) C2-3-4-5.

Table: Neurik Neurological Status.

Neurologic Status Neurik	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Pre-operative	6	9	23	28	19	34
Post-operative 6 Months	26	14	17	21	29	13
1 year	38	16	14	15	23	14
2 years	40	15	13	16	22	14

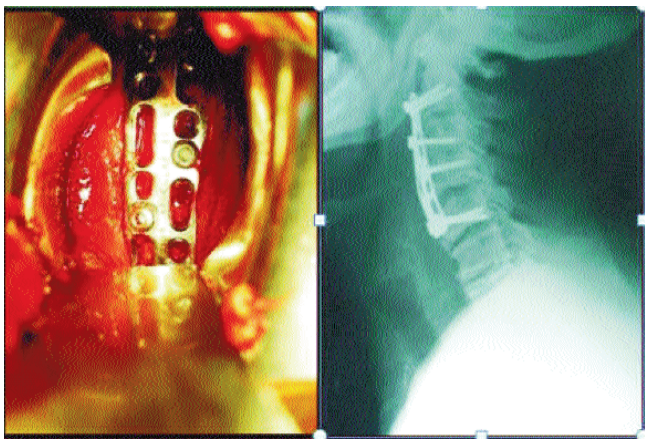

Figure-2: Three level Anterior Cervical Discectomy and Fusion (ACDF) C2-3-4-5.

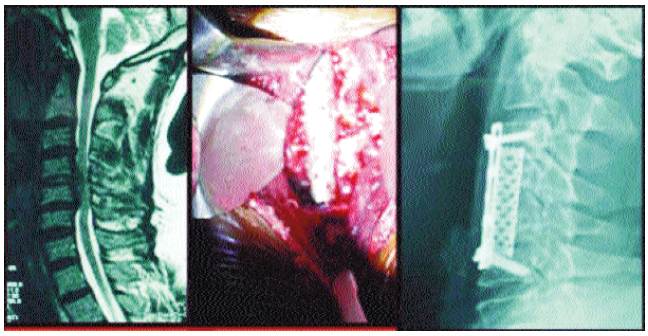

Figure-3: Anterior Cervical Corpectomy and Fusion (ACCF) C3-4-5-6.

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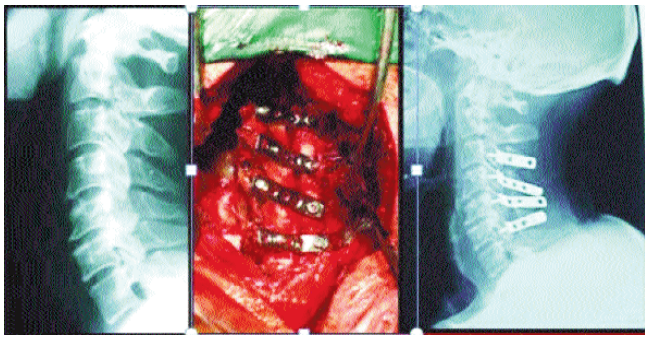

Figure-4: Four level Laminoplasty C3-4-5-6.

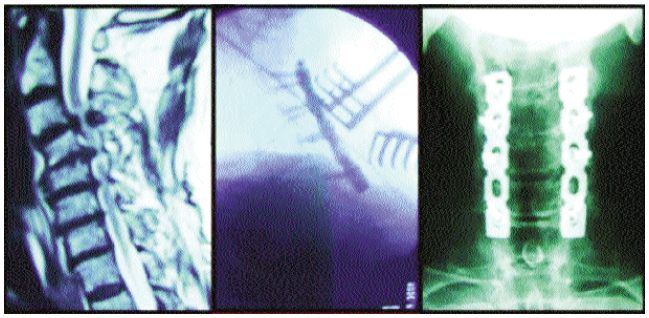

Figure-5: Laminectomy with lateral mass screws and plating C3-4-5-6.

At 6 months Nurick 0 was in 26 %21.67%), I in 14 (11.67), II in 17 (14.16), III in 21 (17.5), IV in 29 (24.16%) and V in 13 (10.83). At one year Nurick grade was 0 in 38 (32.67%, I in 16 (13.33%), II in 14 (11.67), III in 15 (12.5%), IV in 23 (19.16) and V in 14 (11.67%). At the end of 2 years Neurik grade was 0 in 40 (33.33%), I in 15 (12.5%), II in 13 (10.83%), III in 16 (13.33%), IV in 22 (18.33% and V in 14 (11.67%) (Table).

Incidental durotomy in 3 (2.5%), wound infection in 2 (1.67%) and deterioration of neurological status in 3 (2.5%) patients were the only complications.

Discussion

The treatment of CSM is conservative or surgical depending upon severity of the disease. Conservative management, such as physical therapy, cervical immobilisation, or anti-inflammatory medications, is the preferred and often the only required intervention.[15]

Surgical intervention is reserved for those patients who have intractable pain or progressive neurological symptoms. The goals of surgical treatment are decompression of the spinal cord and nerve roots and deformity prevention by maintaining or supplementing spinal stability. The prognostic factor, can be determined by cord shapes and characteristics on (MRI).[15]

Diabetic patients experienced benefits from decompression similar to non-diabetic patients but strict blood sugar control is recommended before surgery.(16) An early surgical intervention is required in these elderly patients to prevent complications and to fix neurological deficits and cardiopulmonary dysfunction.[17] The patients should be informed that motor function impairments of the lower extremities and sensory function impairments of the upper extremities will persist more than the other symptoms after surgery.[18]

Anterior cervical approach is a common approach when compressive pathology is anterior and usually less than three levels or spine is in kyphosis. In the present study in 48 cases anterior cervical surgery was done, disc excision and bone grafting with plate fixation in 26 and corpectomy with cage and plate fixation in 21. Anterior pathology up to three levels was approached anteriorly with anterior cervical discectomy and fusion (ACDF) (Figures-1-2) or anterior cervical corpectomy and fusion (ACCF) (Figure-3).

The spine can be approached posteriorly when pathology is posterior, more than three levels and spine is in lordosis. If patient is young and there is no neck pain posterior cervical laminoplasty can be done without creating spinal instability and kyphosis up to four levels.[19] In present study in 9 patients cervical laminoplasty with plating was done (Figure-4). Multi-level cervical laminectomy with instrumented fusion for patients with CSM has been shown to improve neurological status in majority of the cases.[10] In the present study 61 patients were treated with laminectomy with instrumented spinal fusion using autologus bone graft (Figure-5).

In 37 cases titanium 3.5 mm reconstruction plate with lateral mass screws and in 24 cases lateral mass screw and a rod system were used. Pedicle screws were used only in axis. Use of the cervical pedicular fixation (CPF) provides very strong three-column stabilisation but also carries risk of neurovascular injury.[20] Combined expansive open-door laminoplasty by splitting of spinous processes and selective anterior decompression and fusion achieves complete spinal canal decompression with minimal morbidity. This strategy is effective in improving the surgical outcomes of CSM.[21]

Conclusion

The operative treatment in CSM should be done early before neurological deficits get fixed and when there is less neurological deficit the recovery is more with better functional outcome.

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